

Evaluation of the Southwest Tennessee Community College Solutions TAACCCT Grant: Final Report

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September 2017





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September 2017

A handwritten signature in black ink, appearing to read "Stacey Jordan". The signature is fluid and cursive, with a long horizontal line extending to the right.

Stacey Jordan, Vice President Education

Executive Summary

Southwest Tennessee Community College (Southwest) received a Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant from the U.S. Department of Labor in 2013 to fund the Southwest Solutions program (Solutions). The goal of Solutions is to prepare, credential, and place veterans, dislocated workers, and unemployed or underemployed individuals in high-skill occupations within the manufacturing process control industry. The college received the Solutions grant through the third round of TAACCCT funding.

Industrial process control technology professionals are responsible for planning, analyzing, and controlling manufacturing production processes. The Solutions program awards a series of stacked and latticed credentials to students interested in or already employed in the field. Solutions includes a scale-up of Industrial Readiness Training (IRT), a manufacturing workforce readiness course, as well as a for-credit technical certificate and an associate of applied science (AAS) degree at Southwest in industrial process control technology (IPCT). Solutions also supported short-term training at manufacturing sites and at Southwest through the Lean Six Sigma Yellow Belt and International Organization for Standardization (ISO) Internal Auditor Training.

Evaluation Design Summary

CNA Education served as the third-party evaluator for the Solutions program. The evaluation focused on program implementation and students' academic outcomes. The implementation evaluation used a qualitative case-study approach to gather feedback on the implementation of the program. This formative component of the evaluation sought to answer the four research questions listed below. Sub-questions 1A through 1C were specified in the TAACCCT Round 3 request for proposals:

1. How did the Solutions grant build institutional capacity at Southwest Tennessee Community College?
 - A. How was the particular curriculum selected, used, or created?

- B. How were programs and program design improved or expanded using grant funds? What delivery methods were offered? What was the program administrative structure? What support services and other services were offered?
 - C. What contributions did each of the partners (employers, workforce system, other training providers and educators, philanthropic organizations, and others, as applicable) make toward: (1) program design, (2) curriculum development, (3) recruitment, (4) training, (5) placement, (6) program management, (7) leveraging of resources, and (8) commitment to program sustainability? What factors contributed to partners' involvement or lack of involvement in the program? Which contributions from partners were most critical to the success of the grant program? Which contributions from partners had less of an impact?
- 2. To what extent was grant implementation consistent with the original design? What were the institutional and external factors that contributed to changes in implementation?
 - 3. What are the most promising practices in the implementation of the Solutions grant?
 - 4. What were the challenges to successful implementation of the Solutions grant?

CNA answered these questions using data collected from multiple sources, including interviews with grant staff and employer partners, surveys of students who participated in IRT and short-term training, and an analysis of program documents.

The original design of the impact evaluation was to use a quasi-experimental approach to assess the effect of the for-credit IPCT certificate and AAS degree programs on students' education and employment outcomes. This design was not feasible given that the for-credit programs were not approved until the spring of 2016. There have been few participants in IPCT courses and no completers of certificates or AAS degrees. In addition, the college did not provide comparison group data for the for-credit participants.

Given these limitations, the report includes descriptive statistics about Solutions participants and their academic outcomes. It summarizes the demographics of all students touched by the Solutions grant. These students include IRT participants, participants in other grant-funded, short-term training (Lean Six Sigma Yellow Belt and ISO Internal Auditor Training), and students enrolled in courses in another for-credit program, Advanced Integrated Industrial Technology (AIIT). Grant staff members anticipated that some AIIT courses would also count toward the for-credit programs in IPCT. In addition, AIIT students used equipment funded by the Solutions grant in their courses. Therefore, the AIIT students included in the report were

counted as grant participants. Outcome data for IRT participants include program completion rates and changes in scores on pre- and post-WorkKeys assessments. Finally, the report examines patterns of credits earned and year-to-year persistence among AIIT enrollees.

Implementation Findings

The Solutions grant led to the development of a stacked and latticed credential program in industrial process control technology. Southwest purchased additional equipment and took steps toward the implementation of technical certificate and AAS degree programs in the discipline. However, Southwest experienced implementation challenges that precluded the full implementation of all program components. These challenges included: delays in securing approval for the program from the Tennessee Board of Regents and equipment to support coursework, difficulties related to the organizational structure of grant administration, and limited staff capacity.

The implementation evaluation results section of this report includes information on variations between the implemented program and the original program design, challenges to implementation, and implementation successes. It is organized by program component as follows.

Stacked and latticed credentials: Southwest developed a stacked and latticed credential sequence in industrial process control, which was fully offered to students in the spring of 2016, more than two years into the grant period. Students who complete IRT are eligible to enroll in for-credit technical certificate and AAS degree programs at Southwest in IPCT. With grant funding, the college purchased the instructional equipment necessary to support the program. A delayed implementation timeline prevented on-time, full implementation of this program component. In addition, the administrative structure of the grant led to confusion about who should take the lead on program implementation decisions.

Employer engagement: The original Solutions proposal included a plan for an employer partner workgroup, which was not established. Southwest could have benefited from establishing stronger relationships with employer partners prior to grant implementation. In the final year of the grant, however, Southwest established a TAACCCT 3 Advisory Board to ensure that the college's Round 3 TAACCCT grants were well-aligned with workforce needs. Moreover, Southwest participates in the Process Technology Talent Sector Council, which provides regional feedback on the extent to which industrial process control technology programs align with employer needs. The delayed implementation timeline and college staff turnover led to some challenges with employer engagement; yet industry partners provided positive feedback on the for-credit IPCT curriculum.

Program marketing and participant recruitment: The delayed implementation timeline led to difficulty recruiting prospective IPCT students, who were reluctant to enroll in a program that was not officially offered by the college. This challenge was compounded by the fact that prospective students often had a limited understanding of the industrial process control technology field and the career opportunities available within it. Grant staff members implemented new marketing and recruitment strategies in the final year of implementation.

Prior learning assessments: In the original Solutions proposal, Southwest intended to support Learning Counts, an online portfolio for students developed by the Council for Experiential and Adult Learning (CAEL), which would have included prior learning assessments. Grant staff members determined in the spring of 2014 that the implementation of Learning Counts was not feasible and instead partnered with CAEL to develop challenge assessments for for-credit process control courses. Challenge assessments are locally specific tests that allow students to demonstrate prior learning related to a particular course.

Data and tracking participants: Southwest intended to use Salesforce, a database software program, to track students' progress through the process control career pathway. The software ultimately did not meet the Tennessee Board of Regent's security requirements. Instead, Southwest purchased G*Stars, a program designed to track TAACCCT student data. It was not implemented until the fall of 2015. In the final year of grant implementation, grant staff members transitioned data and student case-management activities to other college offices to ensure the sustainability of data tracking and student support activities.

Lessons Learned

Based on the findings of the evaluation, including the challenges experienced during implementation, the report includes a series of lessons learned from the implementation of Solutions. These could be beneficial for other colleges considering the implementation of similar workforce development programs.

- **Consider the most appropriate design for the program.** According to interview data, the college should have considered, prior to program implementation, whether the length of the for-credit programs aligned with the level of commitment that students would be willing to make to coursework. An alternative approach could have been to develop a short-term, non-credit training program in process control that led to a for-credit program.
- **Conduct a pre-implementation program planning process.** The Solutions grant would have benefited from an in-depth program planning period prior to the submission of the grant proposal. A planning period would have allowed

grant staff members to make decisions related to curricular content, marketing and recruitment, and grant administration before the grant period started.

- **Engage with employers prior to and early in the implementation phase.** An employer advisory board for TAACCCT 3 was not established until 2016, three years into the grant period. An earlier focus on employer engagement could have facilitated ongoing collection of employer feedback and supported additional recruitment efforts.
- **Establish clear lines of administrative authority and succession plans.** The division of responsibility for grant administration between the workforce development department and the for-credit technologies department led to confusion over authority of the grant. Staff members should have established an organizational chart for grant administration, with clear lines of authority and responsibility and information on whom to contact in each department for specific types of information. The college would have also benefited from the development of a succession plan outlining steps for onboarding a staff member into a new role.

Participant Outcomes

Students who enrolled in courses or modules in another program, AIIT, were counted as grant participants. These students were enrolled in courses that Southwest anticipated would also count toward the IPCT credential. In addition, these courses used grant-funded equipment. This report includes descriptive results on students enrolled in for-credit AIIT courses touched by the grant, as well as IRT participants and short-term training participants supported through grant funds.

In total, 407 students completed intake forms and were counted as Solutions participants. Of these, 176 participated in IRT, 107 participated in AIIT, 93 participated in short-term training (Lean Six Sigma and ISO), and 31 were enrolled in another program at the college. The report includes disaggregated results for IRT, AIIT, short-term training, and other participants.

Students enrolled in AIIT courses are approximately 36 years of age on average, while students in IRT are approximately 35. IRT students are less likely to be male than all Solutions participants, while AIIT students are almost all male. A larger percentage of IRT students are African American (92 percent) compared with AIIT students (49 percent). AIIT students are also less likely to be employed at the time of enrollment than IRT students. ISO and Lean Six Sigma participants were older, on average, than IRT participants, and the majority of students were female.

IRT students take three WorkKeys assessments as part of the program to earn a National Career Readiness Certificate. IRT students are more likely to have identical WorkKeys scores at the beginning and the end of the program than to increase or decrease their scores. However, the next most likely outcome was that students improved their scores by one level.

Among AIRT students, 71 percent of students who were enrolled during the first year of data collection persisted to the second year of data collection. These students tended to earn more credits during each specific year than students enrolled only during that year.

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Glossary

AAS	Associate of Applied Science
AIIT	Advanced Integrated Industrial Technology
CAEL	Council for Adult and Experiential Learning
GMACW	Greater Memphis Alliance for a Competitive Workforce
IPCT	Industrial Process Control Technology
IRT	Industrial Readiness Training
ISA	International Society of Automation
ISO	International Organization for Standardization
NCRC	National Career Readiness Certificate
NSCC	Nashville State Community College
OSHA	Occupational Safety and Health Administration
PLA	Prior Learning Assessment
SOCMA	Society for Chemical Manufacturers & Affiliates
TAA	Trade Adjustment Assistance
TAACCCT	Trade Adjustment Assistance Community College Training
TBR	Tennessee Board of Regents
WIN	Workforce Investment Network

Overview of the Southwest Solutions Program and Evaluation

CNA Education served as the third-party evaluator for the Southwest Solutions initiative (Solutions), which is funded through a Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant from the U.S. Department of Labor. TAACCCT grants provide support to community colleges to develop, expand, and strengthen career education programs that can be completed in two years or less. Southwest Tennessee Community College (Southwest) received funding for the Solutions program through the third round of TAACCCT grant awards. The funding period began in October 2013 and continued through September 30, 2017.

Southwest Solutions includes a series of stacked and latticed credentials for students interested in or already employed in the field of industrial process control technology (IPCT). Stacked and latticed credentials help workers advance along a career pathway, move up a career ladder (stacked), or shift to a related field (latticed).

Industrial process control technology professionals are responsible for planning, analyzing, and controlling production processes in a variety of industries. Key skills for process control technicians include: measuring and feeding raw materials into machinery, setting and monitoring indicators, and testing and monitoring products moving through the manufacturing cycle. In Memphis and elsewhere, there is a need for process control technicians in oil and chemical refinement, food and beverage production, waste water treatment, and pulp and paper production.¹

The Solutions grant program consisted of: a scale-up of Industrial Readiness Training (IRT), a four-and-a-half-week non-credit program designed to prepare students for entry-level industrial jobs; a year-long for-credit technical certificate; and an associate of applied science (AAS) degree program in IPCT. The program sought to serve 550 unique participants through IRT and for-credit programs, with 415

¹ Information on the industries in which process control technology careers are available is from the [website](#) of the Nashville State Community College program in Industrial Process Control Technology.

participants completing a TAACCCT-funded program of study. The original program design emphasized collaborative partnerships with industry, community-based organizations, and other higher-education institutions; technology-enabled learning; prior learning assessments; and implementation of a new data system to track student progress and outcomes.

Due to delays in the project timeline, challenges related to the grant and college's organizational structure, and limits to staff capacity and capabilities, components of the Solutions program were not implemented as intended. In total, the grant-funded Solutions programs served 407 participants, 269 of whom participated in a noncredit TAACCCT-funded program (176 IRT students and 93 participants in two-day, short-term manufacturing training programs at Southwest).

Because the for-credit IPCT programs were not offered until the spring of 2016, only 5 students took IPCT courses by the spring of 2017. However, another 107 students enrolled in a different for-credit program, Advanced Integrated Industrial Technology (AIIT), were counted as participants. These students were also considered participants because grant staff members anticipated that AIIT courses would count toward IPCT credentials and because AIIT courses used grant-funded equipment.

Despite the small number of IPCT enrollments, the grant increased Southwest's institutional capacity through development of new for-credit programs, development of related short-term training programs, purchase of new instructional equipment, and stronger relationships with process control employers. The remainder of this section provides an overview of the Southwest Solutions program as it was proposed and implemented and an overview of the third-party evaluation design.

The Southwest Solutions Program as Proposed and Implemented

As proposed, the Solutions career pathway began with IRT, a four-and-a-half-week foundational program in industrial skills. Southwest and the Workforce Investment Network (WIN) developed IRT in 2012 in response to industry feedback that employers were having difficulty hiring candidates for entry-level manufacturing positions. Generally offered in partnership with an employer interested in hiring new workers, IRT provides students with the technical, academic, and workforce readiness skills necessary for jobs in the manufacturing sector. As part of IRT, students take a technical skills assessment developed by Southwest, as well as ACT

WorkKeys assessments in Applied Mathematics, Locating Information, and Reading for Information.²

Students who complete IRT earn a certificate of IRT completion, a National Career Readiness Certificate (NCRC) from ACT based on WorkKeys scores, and an Occupational Safety and Health Administration (OSHA) 10-hour General Industry Safety Certificate. Through the OSHA-related instruction, IRT provides participants with an awareness of workplace health and safety issues. IRT completers are considered prepared for entry-level employment and are eligible to transition into other technical training programs at Southwest, including the for-credit IPCT programs offered through Solutions.

To continue the career pathway, Southwest adopted and implemented a for-credit technical certificate, Process Control Fundamentals, and an AAS degree in IPCT. The AAS degree has two concentrations: process control technician and maintenance technician. These technicians play an active role in the production process, from the acquisition of raw materials through the distribution of products to customers.

Each Round 3 TAACCCT grantee was required to indicate how its project would address six core elements. The implemented Solutions program diverged from the proposal, largely due to a slow implementation timeline and limited staff capacity. Following the brief overview here, the implementation study findings provide greater detail on how the implemented program differed from the intended design and how implementation challenges contributed to these differences.

Evidence-based design: The development and scale-up of the Solutions program was based on the design and evidence emerging from several stacked and latticed credential models, including the Integrated Basic Education and Skills Training (I-BEST) program in Washington State (Jenkins, Zeidenberg & Kienzl, 2009) and the Joyce Foundation's Shifting Gears initiative (Roberts & Price, 2012).

Stacked and latticed credentials: The Solutions proposal envisioned development of a stacked and latticed credential program in which IRT completers could transition to for-credit technical and AAS degree programs in IPCT. Solutions sought for all courses to align with the AAS degree, which was based on a program previously implemented at Nashville State Community College (NSCC). Following the selection of NSCC's curriculum, Southwest was required to seek program approval from the Tennessee Board of Regents (TBR). The approval process took more than a year, which delayed the implementation. Process control technology courses were not

² In the summer of 2017, ACT changed the names of the WorkKeys assessments to Applied Math, Graphic Literacy, and Workplace Documents; we refer to these assessments by their initial names, which would have applied for the vast majority of students.

offered to Southwest students until the spring of 2016. Due to the delayed timeline, Solutions faced challenges related to both recruitment and development of strong employer partnerships.

Solutions funded the scale-up of the IRT program. Two other Round 3 TAACCCT grants at Southwest also supported the expansion of IRT. Which TAACCCT grant funded a specific section of IRT depended on the workforce needs of the employer sponsoring the class. Solutions funded sections of IRT when the sponsoring employer needed process control technology employees.

In addition to IRT, Solutions staff members used grant funding to partner with process control employers to develop onsite training courses customized to their specific needs. In the final year of the grant, Southwest implemented additional short-term manufacturing training programs that provided students with certificates from the International Organization for Standardization (ISO) and Lean Six Sigma (Yellow Belt). Solutions, in addition to the other Round 3 TAACCCT grants awarded to Southwest, contributed to the cost of these training programs.

Southwest also incorporated prior learning assessments (PLAs) into the Solutions proposal. Originally, Southwest planned to partner with Council for Adult and Experiential Learning (CAEL) to develop Learning Counts portfolios for participants to track PLA credit and academic progress. Grant staff members determined that it would not be possible to offer Learning Counts in the spring of 2014. Therefore, CAEL developed a series of PLAs, called challenge assessments, for specific courses, so that students could earn credit for previous training or experience.

Transferability and articulation of credit: Technical certificate and AAS degree programs were based on an existing program at NSCC. TBR policy requires that programs offered in the same subject be consistent across the state of Tennessee. Thus, a student who began the program at Southwest could transfer credits to NSCC.

The developers of Solutions originally proposed articulation agreements with four-year engineering programs at the University of Memphis and Christian Brothers University. Despite outreach efforts, these agreements were not established. Efforts are ongoing to establish articulation agreements with applied four-year degree programs at the University of Arkansas-Fort Smith and the University of Tennessee-Martin that align with IPCT courses.

Advanced online and technology-enabled learning: The Solutions team proposed the adoption of an online portfolio that students could use to track their progress; it would use CAEL's Learning Counts Portfolio as a platform. The platform would include results from KeyTrain, the career readiness training system used in IRT, and Amatrol, the instructional program used in the for-credit programs. Amatrol includes self-paced instruction online and via simulations with realistic manufacturing machinery in the Solutions laboratory space at Southwest. The portfolio would be

accompanied by a back-end data system allowing faculty and staff members to track progress through KeyTrain, Amatrol, and Learning Counts. Faculty would use Salesforce, a database software, to track student outcomes.

The portfolio and data system were not implemented as intended. Students do not have access to an online tool to chart their progress, although they can still chart their progress in IRT through KeyTrain and in for-credit coursework through Amatrol. In the spring of 2015, the Solutions team determined that it was unable to purchase Salesforce due to the TBR security requirements. Therefore, Southwest purchased and implemented G*Stars, an online data tracking system designed specifically to track TAACCCT data.

Strategic alignment with relevant community partners, especially businesses: Per the grant proposal, Southwest planned to establish five partner workgroups to facilitate the implementation of Solutions: (1) data collection, (2) online technology, (3) workforce development, (4) articulation agreements, and (5) employer partners. Southwest Solutions staff members engaged in efforts to develop these groups early in the grant period, but they were not established.

Despite incomplete partnership-building, Southwest staff members worked to engage employers with the grant. In 2016, three years into the grant period, Southwest established a TAACCCT 3 Advisory Board for the three Round 3 grants on campus. The board provides guidance to Southwest to ensure that the college's workforce development and industrial training programs are well-aligned with the needs of local industry. In addition, in partnership with the Greater Memphis Alliance for a Competitive Workforce (GMACW) and the Arkansas State University Mid-South, Southwest participates in the Process Technology Talent Sector Council. Postsecondary institutions and employers share information about industry needs and educational programming available.

Alignment with previously-funded TAACCCT projects: Southwest partnered with Mount Wachusett Community College in Massachusetts, which received a Round 1 TAACCCT grant that facilitated the development of business and information technology and reduced barriers to entry for biotechnology students. Throughout the grant period, Southwest stayed in contact with Mount Wachusett to share promising practices. In the fall of 2016, the Mount Wachusett connected Southwest with a workforce development consultant, who partnered with Southwest to develop a strategic plan for the remaining months of implementation.

Design of the Solutions External Evaluation

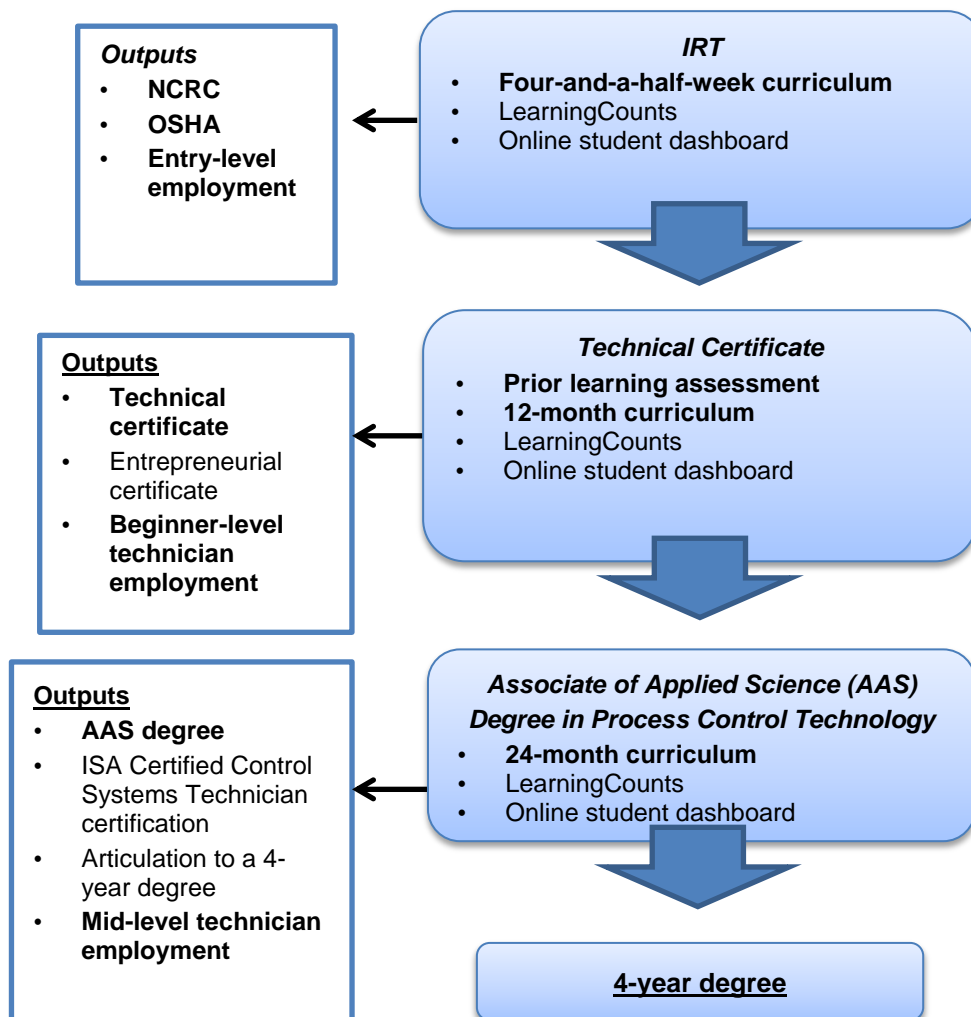
CNA Education served as the third-party evaluator for the Solutions program. The original intent was for the evaluation to use a mixed-methods research design with a

focus on the implementation and overall effectiveness of the Solutions initiative. However, the study design varied from the original design due to data limitations. This section describes the data and methodological approaches used to determine the results included in the final report.

Implementation Study Design

To guide the evaluation of Solutions, CNA developed a logic model in consultation with grant staff in 2014. It outlined the grant activities supporting six core components of the Solutions program and provided a framework for the development of the analysis plan (Figure 1). In the figure, the bolded items indicate grant activities that were implemented during the four-year performance period.

Figure 1. Southwest Solutions Logic Model



The implementation evaluation used a qualitative case study approach (Yin, 2014), gathering and triangulating feedback from multiple sources to assess the strengths and weaknesses of implementation. The implementation evaluation sought to answer several related research questions. Questions 1A – 1C were required implementation research questions within the Department of Labor solicitation for grant applications for TAACCCT Round 3. CNA included these questions under a broader question focused on how the Solutions grant built institutional capacity (question 1). The research questions for the implementation evaluation were:

1. How did the Solutions grant build institutional capacity at Southwest Tennessee Community College?
 - A. How was the particular curriculum selected, used, or created?
 - B. How were programs and program design improved or expanded using grant funds? What delivery methods were offered? What was the administrative structure? What support services and other services were offered?
 - C. What contributions did each of the partners (employers, workforce system, other training providers and educators, philanthropic organizations, and others as applicable) make toward: (1) program design, (2) curriculum development, (3) recruitment, (4) training, (5) placement, (6) program management, (7) leveraging of resources, and (8) commitment to program sustainability? What factors contributed to partners' involvement or lack of involvement in the program? Which contributions from partners were most critical to the success of the grant program? Which contributions from partners had less of an impact?
2. To what extent was grant implementation consistent with the original design? What were the institutional and external factors that contributed to changes in implementation?
3. What are the most promising practices in the implementation of the Solutions grant?
4. What were the challenges to successful implementation of the Solutions grant?

To address these questions, CNA employed multiple data-collection strategies throughout the grant period (Table 1). We conducted annual site visits to Southwest to conduct in-depth interviews with grant staff members and tour laboratory facilities. During the 2017 site visit, CNA researchers observed a meeting of the TAACCCT 3 Advisory Board. In the fall of 2016 and spring of 2017, CNA conducted in-depth interviews with employer partners who either had a role in the development of the for-credit process control curriculum or collaborated with Southwest to implement customized training programs. The number of employer interviews was

limited to three due to other respondents' lack of responsiveness or availability. Finally, CNA conducted an analysis of program documents during the last year of grant implementation.

During Year 3, CNA surveyed participants who completed IRT or customized short-term training opportunities. The surveys focused on students' reasons for enrolling, the extent to which programs improved students' skills, and student satisfaction. Survey results are included in the 2016 interim evaluation report.

Table 1. Implementation Data-Collection Activities

Year	Data-Collection Activities	Participants
2015	Semi-structured site visit interviews with 8 grant staff members	Grant counselor, employment specialists (2), IRT instructors (2), intake specialist, for-credit technologies instructor, and Solutions laboratory technician
2016	Site visit interviews with 6 grant staff members	Grant counselor, academic specialist, employment specialist, intake specialist, laboratory technician, and for-credit technologies instructor
	Survey of IRT and short-term training participants	Solutions-sponsored IRT participants and completers of short-term training at Chemours and Steel Warehouse/SFI
2017	Site visit interviews with 11 grant staff members	Associate Vice President of Workforce Development, Director of Externally Funded Programs, grant coordinator, academic specialist, data administrator, IRT manager, IPCT coordinator, laboratory technician, career services director, student services director, and TAACCCT 3 consultant
	Employer partner interviews Program document analysis	3 employer partners

Interviews with staff members focused on program design and development; curriculum; student support services; student outcomes; successes; and programmatic challenges, lessons learned, and implications for sustainability. The Appendix includes an example of an interview protocol developed for these site visits. To analyze interview data, the evaluation team transcribed the interviews and coded them inductively, carefully reading the interview transcripts and developing descriptive codes designating themes related to implementation challenges, promising practices, and grant sustainability.

The 2017 document analysis included quarterly reports that Southwest submitted to the U.S. Department of Labor, institutional documents related to program implementation, and Solutions promotional materials. CNA also analyzed documents related to the TAACCCT 3 Action Plan, a strategic plan for the final nine months of program implementation jointly developed by grant staff and an external consultant. The evaluation team coded the documents inductively, using the same process as for interview transcriptions.

Outcomes Study Design

The original outcomes evaluation research design proposed using a quasi-experimental approach to assess the impact of Solutions on participating students' education and employment outcomes. However, the evaluation team was unable to conduct the outcomes evaluation as intended due to the small number of for-credit participants (e.g., no treatment group data for IPCT participants), the lack of comparison group data, and limited data on employment outcomes. This section describes the proposed study design, why it was not feasible, and an overview of the descriptive results provided in the evaluation report.

Proposed Outcomes Evaluation Research Design

As proposed, the evaluation sought to answer the following research questions:

1. Do Southwest students participating in the Solutions program achieve better educational outcomes than non-participating Southwest students?
2. Do Southwest students participating in the Solutions program achieve better employment outcomes than non-participating students?

The evaluation proposed to use a propensity score matching design to compare outcomes for for-credit Solutions participants and a comparison group of students in similar for-credit programs at Southwest. CNA planned to track educational and employment outcomes. Educational outcomes included year-to-year retention in the program, credit accumulation, completion of a program of study, attainment of

industry-recognized credentials, and enrollment in further education. CNA also planned to track students' employment and earnings outcomes during the program. The original design did not include a comparison group for IRT participants because there was no comparable population from which to create one.

Infeasibility of Quasi-Experimental Design

It was not feasible to implement propensity score matching because it was not possible to develop treatment or comparison groups for IPCT participants at Southwest. The for-credit technical certificate and AAS degrees were not available until the spring 2016 semester. No students have completed either program, and there were only 5 enrollments IPCT courses through the spring 2017 semester. In addition, the college did not provide comparison group data, a requirement of the propensity matching approach.

The design was also complicated by for-credit students whom Southwest counted as grant participants before the launch of the IPCT courses. During the initial months of the grant, the college anticipated that the certificate and AAS degrees would share courses with another technology program, AIIT, which also used grant-funded equipment. Students enrolled in these courses were asked to fill out grant intake forms. Therefore, many students counted as participants were likely pursuing a credential unrelated to the Solutions TAACCCT grant. It is difficult to distinguish which students, if any, intended to earn a credential in IPCT.

Descriptive Results on Solutions Participants Included in the Report

The results include descriptive statistics on all students who completed intake forms and were counted as Solutions participants, as well as disaggregated data on participants in IRT, AIIT, short-term training supported by the grant, and other programs. In addition, the report includes descriptive information on medium-term outcomes for IRT and AIIT participants. Results on IRT participants include comparisons of WorkKeys test scores at the beginning and the end of IRT and their program completion rates. The AIIT results focus on credit attainment and persistence.

Implementation Study Findings

This section presents the final results of the implementation evaluation, based on the final round of interviews with grant staff members, interviews with employers, and an analysis of program documents. The findings are organized by program component, as follows:

- Stacked and latticed credential development and implementation
- Employer engagement
- Marketing and participant recruitment
- Prior learning assessments
- Data and tracking participants.

Each subsection includes:

- An overview and timeline of program implementation
- A discussion of how implementation varied from the original program design
- A description of challenges related to the successful implementation of the grant
- A description of promising practices and how grant activities in each area increased Southwest's institutional capacity.

Stacked and Latticed Credential Development and Implementation

The Solutions grant program was designed to be a stacked and latticed credential program within the field of process control. The career pathway began with a scale-up of IRT, an existing manufacturing readiness training program that provides participants with foundational technical, academic, and workforce readiness skills. IRT prepares students for both entry-level manufacturing positions and to articulate into for-credit technologies programs at Southwest.

Through the Solutions grant, Southwest adopted and implemented for-credit IPCT programs, including a 23-credit process control technology certificate and a 60-credit AAS degree with maintenance technician and process control technician concentrations. The Solutions grant proposal envisioned that the for-credit program would be implemented during the 2014/15 academic year, with 40 students completing credit hours in Year 1. In reality, the program approval process took much longer than anticipated and delayed the implementation timeline (Table 2).

Table 2. Implementation Timeline for Stacked and Latticed Credentials

Date	Solutions Project Milestone
Fall 2014	Contracted with a curriculum specialist to develop a plan for the technical certificate and AAS, based on an existing curriculum at Nashville State Community College
December 2014	Draft curriculum completed List of equipment to purchase submitted to the U.S. Department of Labor
Spring 2015	Abstract of technical certificate and AAS curricula submitted to the TBR
Spring 2015 – Present	Discussion of potential national certificates to incorporate into the certificate and AAS degree
Summer 2015	Program abstract approved by the TBR, which proceeded with an additional 30-day review process
November 2015	TBR approval of the certificate and AAS degree in IPCT
2015 – 2016 academic year	Development of corporate training courses on process control topics; corporate training at Steel Warehouse/SFI and Chemours
Fall 2016	Additional corporate training at Steel Warehouse/SFI
Spring 2017	Development and implementation of short-term job training programs from the ISO and Lean Six Sigma

Variation from Original Program Design

By the conclusion of the four-year grant period, the college had implemented a career pathway program for Solutions that included IRT, additional short-term training related to industrial careers, and the IPCT technical certificate and AAS degree.

IRT was originally developed as part of the Made in Memphis initiative, a partnership between Southwest, the Workforce Investment Network (WIN), and the Greater Memphis Chamber of Commerce designed to create a pipeline of skilled workers to meet the needs of local manufacturing. Participants who complete IRT receive a certificate of IRT completion, an ACT National Career Readiness Certificate, and an Occupational Safety and Health Administration (OSHA) 10-hour General Industry Safety Certificate. The three Round 3 TAACCCT grants at Southwest supported sections of IRT based on specific companies' training needs. If a company needed to fill process control-related jobs, Solutions funded the section of IRT.

Staff members also invested grant funds in short-term workforce training customized to employer needs. Southwest developed a syllabus and course outline for corporate training materials used to teach process control at local employers' facilities. Faculty members partnered with Chemours and Steel Warehouse/SFI to offer customized process control training at the companies' manufacturing work sites. In addition, Solutions funds supported the implementation of free certification classes for ISO Internal Auditor Training and Lean Six Sigma Yellow Belt.

The 2013 Solutions grant proposal included plans for incorporating an entrepreneurial certificate into the technical certificate for students interested in starting their own businesses, which would have been developed in partnership with the Kaufman Foundation's JumpStart program. In addition, program designers intended that the AAS degree lead to an industry-recognized certificate, the International Society of Automation (ISA) Certified Controls Systems Technician. Neither the Jumpstart nor the ISA programs were implemented, largely because approval of the for-credit programs took much longer than anticipated. At Southwest, discussion of incorporating national industry-recognized certifications into the technical certificate and AAS degrees continues.

Challenges to Successful Implementation of Stacked and Latticed Credentials

During the grant period, several challenges slowed or inhibited the full implementation of the for-credit technical certificate and AAS degree. Primary obstacles included: a delayed timeline, the organizational structure of grant administration at Southwest and related staff capacity limitations, and grant staff and leadership turnover.

Delayed Implementation Timeline

The delayed timeline for launching the for-credit programs was a major challenge for implementing the Solutions program as intended. Although those who designed the program anticipated offering the process control curriculum during the 2014/15 academic year, Southwest did not offer IPCT as an official program until the spring 2016 semester. In addition, procuring equipment using grant funds took longer than anticipated.

The original grant proposal did not include time for selection, development, and approval of the draft IPCT curriculum. The first grant coordinator was hired in the spring of 2014. Following his hire, startup activities took several months. In the fall of 2014, Southwest contracted with subject matter experts to develop the curriculum. During development, employer partners reviewed and commented on the curriculum content. An abstract of the draft curriculum was submitted to the TBR in early 2015.

It is unclear why it took several months for the TBR to approve the curriculum abstract. The college received an initial, tentative approval in July 2015. At that time, the TBR initiated another 30-day approval process, which also took longer than anticipated. E-mail correspondence between the grant coordinator and a contact at the TBR indicates that there was some confusion about the level of detail required in the program application, given that it was a near duplication of an existing program at NSCC. Due to these delays, the college did not receive full approval from the TBR to offer the for-credit programs until November 2015.

The delay in the approval process contributed to challenges with student recruitment and the development of employer partnerships, described in subsequent sections of this report.

Procurement of hands-on learning equipment for the Solutions laboratory at Southwest was similarly delayed. Grant staff considered the process administratively burdensome. The grant coordinator submitted a purchase requisition to the U.S. Department of Labor in late 2014 but did not receive approval because the document was incomplete. Based on feedback from the project officer at the Department of Labor, the grant's academic specialist revised and resubmitted the document but did not receive a response. Six months later, the college learned that it had submitted the request in an incorrect format. Grant staff members said that they would have liked additional and quicker feedback from the Department of Labor so that they could have completed the equipment procurement process more efficiently.

Challenges with the Organizational Structure of the Grant

The organizational structure of the grant administration team may have also contributed to the delayed implementation timeline. The grant originally funded both

a grant coordinator and a finance and procurement specialist. From the beginning of the grant period until August 2016, roles were designated so that the procurement specialist served as the sole liaison between Southwest and the Department of Labor. She initiated all communication between the two organizations. The grant coordinator chose not to communicate directly with the project officer at the Department of Labor, which likely slowed the equipment procurement process.

The grant proposal's original timeline did not account for start-up and planning time required prior to implementing grant activities. After receiving the TAACCCT grant, Southwest hired all new staff with roles specific to the grant, some of whom had little experience in community college workforce development programs. According to one interview respondent, at the beginning of the grant period, "it was hard to just bring new people in and expect them to know exactly what to do...everybody was new and trying to get their feet under them." A grant staff member explained that the workforce development department's leadership had not expected to win all three Round 3 TAACCCT grants and did not have sufficient organizational capacity to effectively implement the three projects simultaneously.

In addition, the grant required communication and coordination across and within college departments. Some interdepartmental confusion resulted from the fact that the grant was administered through the non-credit workforce development department, but the IPCT instructional programming would be implemented by the for-credit technologies department. There was confusion about who should make decisions related to the grant. When interviewed in 2017, grant leadership indicated that the original grant coordinator did not feel empowered to provide direction to academic faculty or make decisions related to the grant without consulting faculty members. The grant coordinators also experienced challenges navigating the college's bureaucracy— for example, a lack of responsiveness from departments such as accounts payable that were not funded directly by the grant. These departments were often unfamiliar with the grant or their role in supporting it. According to one of the coordinators, "things would have been a lot easier if every time you went to interact with someone on behalf of your grant, you didn't have to go into the conversation about who are you and what are you doing."

Turnover

Ongoing turnover of grant staff, as well as departmental and college leadership, was a major challenge for the implementation of the Solutions grant. There have been three leadership transitions in the workforce development department, including one currently ongoing, over the course of the grant. The most recent Associate Vice President of Workforce Development assumed her position in August 2016 and served until June of 2017. Each change in management required time to reorganize and strengthen the grant team.

The grant's staffing structure changed several times during implementation, which led to a loss of institutional memory when staff members transitioned off the project. There were three grant coordinators during the grant period. The second grant coordinator was familiar with the project, since she had previously served as a grant counselor. Nonetheless, each transition required time for the new coordinator to become familiar with his or her new role.

Other staff members turned over as well. At first, the grant supported guidance counselors and employment specialists, who were tasked with building and strengthening relationships with employer partners. The employment specialist positions were eliminated in 2016, and responsibilities for employer partnerships shifted to the grant coordinator. Likewise, three different staff members were charged with collecting data on participants at various points during the grant period. Like the coordinators, the new data administrators required time to familiarize themselves with the project.

Turnover at the college was compounded by turnover at WIN, Southwest's partner in administering the IRT program. According to a current grant staff member, "The consistent theme is constant turnover." He advised that everyone on the grant team be familiar with what the grant coordinator is doing and his or her rationale for each decision-making process. He noted that strong documentation and communication are critical to the success of federally funded grants similar to Solutions.

Strengthened Institutional Capacity

Despite the challenges above, developing and implementing the IPCT career pathway has strengthened the college's institutional capacity, largely through the availability of new programs and the purchase of new equipment to support those programs. Under the grant, Southwest also developed new short-term training to provide additional workforce development opportunities for unemployed and underemployed students as well as incumbent workers seeking to advance at their companies within the process control field.

New Curricular Offerings

The Solutions grant established a career pathway for process control technicians, for whom employer demand is growing in the greater Memphis area. In the fall of 2014, Mid-South Community College in West Memphis, Arkansas (now known as Arkansas State University (ASU)-Mid South) and Southwest held a Greater Memphis Process Technology Forum, which included an informal survey of the needs of 15 process control employers. Annual hiring needs averaged a minimum of 80 open process control positions per year, with 12 of the 15 employers expecting demand to increase in the future (The Manufacturing Institute & Thomas P. Miller, 2015). The Solutions program established Southwest as a training site for process control technicians.

The majority of IPCT courses are based on the Amatrol program, an online applied technical training system. Students complete web-based modules at their own pace. The onsite technologies laboratories at Southwest let students apply the skills from a specific module on corresponding Amatrol equipment. Technologies program faculty members and laboratory technicians are available to offer additional instruction and answer students' questions. At the end of each instructional unit, students take a hands-on assessment using Amatrol equipment. Technology faculty or staff members are available to students in the Solutions laboratory from early morning until the evening to accommodate students who work a range of job shifts.

Since its implementation, Southwest faculty members have revised the for-credit program to better meet the needs of Southwest students, while ensuring it remained consistent with the existing program at NSCC. They reorganized instruction into shorter module units within IPCT courses. According to the technologies department's IPCT program coordinator, the new curriculum organization allows students to gain specific skills and apply them on the job more quickly than the original approach. The ability to apply skills on the job is especially important because, according to the coordinator, the majority of Solutions students are already working in manufacturing settings. The IPCT coordinator contrasted the student population at Southwest with that of NSCC, noting that students at Southwest were more likely to be older and employed full time while NSCC was "more of a trade school with traditionally-aged college students."

The IRT program, the first step in the career pathway, fills an important role in upskilling students who are not academically and technically prepared for for-credit programs in process control. Many students who enroll at Southwest and similar institutions lack basic skills in reading, math, and technical literacy. Through the expansion of the IRT, Southwest could serve as a regional training hub for workers requiring additional basic skills. ASU-Mid South recently developed a process control technology program as part of a TAACCCT Round 4 grant awarded to ASU Mid-South, Southwest, and two other higher-education institutions. Given the student population's need for basic skills remediation, external consultants recommended that ASU Mid-South use Southwest's IRT course to upskill its students (The Manufacturing Institute & Thomas P. Miller, 2015). Through the TAACCCT Round 3 grants, Southwest has expanded IRT and solidified the program as a regional training resource.

Other Short-Term Training Opportunities

In addition to supporting sections of IRT, the grant supported employer partnerships to offer onsite, short-term training focused on process control technology. In order to offer customizable training, Southwest purchased training curricula: the Society for Chemical Manufacturers & Affiliates (SOCMA) Chemical Process Operator Training, as well as the Basic & Advanced Mechanical-Electrical-PLC-Process Control

Training, developed by Scientific Management Techniques. Southwest purchased the SOCMA curriculum at the request of Penn A. Kem, a chemical development and manufacturing company based in Memphis.

The grant has supported the development of customized short-term training opportunities at Steel Warehouse/SFI, a steel machining and fabrication company, and Chemours, a chemical manufacturer. Southwest worked with Steel Warehouse to develop a multi-phased curriculum for training technicians to maintain conveyor belts designed to carry steel. According to a company representative, applicants for maintenance positions tended to have experience in logistics and distribution, given the industry's presence in the Memphis area. Their lack of experience with steel necessitated additional on-the-job training. Steel Warehouse partnered with Southwest to develop a customized curriculum based on the existing technical curricula available at Southwest. The college provides instructors to Steel Warehouse who use company equipment to teach the courses. A Steel Warehouse representative described the courses as "wonderful," noting, "We've gotten a lot of participation [in the classes]. The majority of the professors that Southwest sends out are very interactive. The participants seem like they're enjoying it very much."

In the spring of 2017, Southwest began offering short-term workforce development training programs supported through Solutions and the other two Round 3 TAACCCT grants at Southwest. ISO Internal Auditor Training is a two-day workshop on the knowledge and skills necessary to conduct internal quality systems audits. Participants receive two certifications from ISO at the conclusion of the workshop. Lean Six Sigma Yellow Belt training is also a two-day workshop. It focuses on how to reduce waste and improve efficiency within industrial settings. Completers receive a Lean Six Sigma Yellow Belt certification.

During the 2016/17 academic year, Solutions focused on recruiting participants for the ISO and Lean Six Sigma trainings. The college was successful recruiting participants into these programs, compared to for-credit Solutions programs. In total, 93 students participated in the trainings in the spring of 2017. According to a grant staff member, the short-term training opportunities allowed for more completers of Solutions-funded programs, since at the conclusion of the workshops students take an assessment and earn a certification.

According to grant leadership, a disadvantage of ISO and Lean Six Sigma training is the short amount of time students are engaged with the college. The short timeframe does not allow college staff to establish strong relationships with students or effectively track their post-program outcomes.

New Equipment

Delays in purchasing equipment for the Solutions laboratory presented an implementation challenge for the grant. The lab was not fully equipped until the

summer of 2016. Nonetheless, grant funding eventually provided the equipment necessary to offer IPCT courses. The college purchased 10 hands-on learning systems and pieces of training equipment to support process control technology. Southwest acquired the first piece of equipment for the laboratory in February 2016, three pieces of equipment in April 2016, and the remaining equipment in June 2016. The training equipment supports instruction in a variety of industrial processes related to process control technology.

Engagement with an External Implementation Consultant

In the fall of 2016, the coordinators of the three TAACCCT grants at Southwest partnered with an external consultant to develop a strategic plan for the remaining months of program implementation. The consultant, a former paper executive and strategic planning expert, had provided technical assistance to Mount Wachusett Community College as part of its TAACCCT program. The two-page plan included five goals related to participant recruitment, outcome measures, employer engagement, and course schedules, followed by a series of concrete actions, responsible individuals, and internal deadlines. The plan led to actions in marketing, participant recruitment, and employer engagement. Marketing activities included the development of promotional materials and a script on the process control program for recruitment presentations. The establishment of the TAACCCT 3 Advisory Board was also originally outlined in the plan.

The consultant also assisted with the implementation of ISO and Lean Six Sigma trainings and connected Southwest with contacts at the two organizations. Overall, grant staff members found the consultant's assistance very helpful. According to one, "We have been able to successfully have a strong push at the end of the grant, and it's all because of him. He came in and streamlined things, and he helped us figure out where we needed to go and what we needed to do. He helped us make sure we were able to implement the plan and has connected us with resources."

Employer Engagement

The original Solutions grant proposal emphasized developing and strengthening partnerships with employers to ensure that the IRT and IPCT programs were well-aligned with industry needs. The proposal indicated that the college would establish five workgroups, including an employer partner workgroup. Although Southwest recruited members for the workgroup, it did not convene. Instead, Southwest staff elected to meet with employer partners on an individual basis. Although the workgroup was not established, Solutions grant staff members took steps to engage employers, particularly during the final year of grant implementation (Table 3).

Table 3. Implementation Timeline for Employer Engagement

Date	Solutions Project Milestone
Spring 2014	Employer partner workgroup membership established
June 2015, November 2015, and February 2016	Solutions grant staff members meet with industry partners and representatives of the Greater Memphis Alliance for a Competitive Workforce (GMACW)
Spring 2016	Southwest begins participating in the Process Technology Talent Sector Council
August 2016 and November 2016	Process Technology Talent Sector Council meetings at Southwest
Fall 2016	TAACCCT 3 Advisory Board established

Variation from Original Program Design

Instead of establishing an employer workgroup specific to Solutions, staff members asked for feedback from individual area employers. In total, the grant shared information about the program with 17 area companies with a potential need for process control employees. The college developed more in-depth partnerships with several companies that provided feedback on the for-credit courses and equipment and reviewed the curriculum as part of the TBR approval process. During the 2016/17 academic year, the Solutions team increased its efforts to engage employers through participation in the Process Technology Talent Sector Council and the establishment of the TAACCCT 3 Advisory Board.

Challenges to Employer Engagement

A primary challenge for employer engagement was that employer partnerships were not established prior to program implementation. The Solutions grant proposal to the U.S. Department of Labor was written as though the employer work group was already established, which it had not been. Although grant staff conducted outreach to individual employers and solicited their advice on the extent to which the program aligned with industry needs, wide-scale employer feedback was not collected until Southwest began participating in the regional Process Technology Talent Sector Council in the spring of 2016 and established the TAACCCT 3 Advisory Board in the fall of 2016.

A lack of employer responsiveness to outreach requests may have contributed to the delayed development of relationships. Grant staff found it difficult to incentivize employers to visit the college to provide feedback on the curriculum or laboratory

equipment because employers tended to have other obligations. For example, nine employers responded “yes” to an invitation to participate in the TAACCCT 3 Advisory Board that the evaluation team observed in March 2017, yet only three employers were able to attend the meeting.

Because a Southwest-specific employer advisory board was not established until 2016, the college received some employer feedback late in the grant period that might have been helpful earlier. For example, during the March 2017 TAACCCT 3 Advisory Board meeting, employers informed grant staff members about the test used to assess the skills of prospective employees (the Ramsay Assessment). This information would have been useful during the curriculum planning stages, when Southwest could have ensured that the curriculum was aligned to the assessment. In addition, members provided feedback on how best to engage with employers. Advisory Board members recommended that college staff members visit employers on-site, rather than requesting that they come to the college on a regular basis.

Program Implementation Delays

The nearly year-long period required to secure approval from the TBR contributed to challenges establishing and strengthening partnerships with industrial process control technology employers. Prior to the implementation of the for-credit programs in the spring of 2016, some employers were reluctant to partner with the college because they did not know whether the skillset that students would develop through the program would align with their needs. Employers expressed interest in examples of graduates of the program or current students working in the process control field, which the college was unable to provide.

Staff Turnover

According to one employer partner, staff turnover at Southwest contributed to slow responses related to offering customized, on-site training courses. The employer was frustrated with the turnover, particularly transitions to new workforce development leadership, saying:

it is like we have to start over all the time...what happens is I don't realize someone's left and I'm waiting on feedback from them. Then, through the grapevine, I learn that they're gone. There's not that introduction where they transition us to the next person. If there's any way to retain their people better, that would be wonderful.

Despite these challenges, the employer partner reported being pleased overall with the short-term training course at the company. The employer had requested that Southwest faculty teach the class based on their in-house equipment and schematics. Instructors came to the work site to gain an in-depth understanding of how they could customize Southwest's existing curriculum for the employer. The employer

representative said, “They really engaged to understand our business and be able to teach the students the specifics of what we needed as a company.” She praised the instructional team at Southwest for operating as a responsive, “well-oiled machine,” despite leadership turnover. The employer partner said that the course was helping to fill skill gaps among the company’s workforce and that supervisors and students alike were satisfied with the course.

Employer Engagement Strengths

One of the goals of the TAACCCT 3 Action plan, developed in partnership with the external consultant in 2016, was to reengage local employers in the industries served by the TAACCCT grants. In 2016 and 2017, Solutions scaled-up employer engagement through involvement with the Process Technology Talent Sector Council and the establishment of the TAACCCT 3 Advisory Board. In addition, employer partners indicated that they were satisfied with the for-credit process control curriculum and that it was well-aligned with their workforce needs.

Process Technology Talent Sector Council

The Greater Memphis Alliance for a Competitive Workforce (GMACW) was formed in 2014 as a joint initiative of the Greater Memphis Chamber of Commerce and the Memphis and Shelby County Regional Economic Development Plan, in partnership with the Brookings Institution. The mission of GMACW is to ensure that local postsecondary education and workforce development programs are well-aligned with employers’ needs. GMACW facilitates sector-specific councils, including the Process Technology Talent Sector Council. The council articulates career pathways for the field and provides feedback to education programs on current and future workforce needs.

Southwest regularly participates in sector council meetings, which were held on the college’s campus in August and November of 2016. During each meeting, Southwest made an effort to familiarize employers with the process control programs and connect Southwest students to process control employers. In August, the grant team offered an overview of the IPCT program, as well as customizable work-based training in process control. During the same meeting, faculty members offered a tour of the process control laboratory. In November, Southwest held a process control career fair in conjunction with the meeting.

Positive Feedback on the IPCT Curriculum

Overall, employers interviewed for the evaluation were satisfied with the IPCT curriculum, although they would make adjustments based on company needs. An employer whom Southwest consulted about the curriculum said that new hires without experience are unlikely to have training in process control. Onboarding

inexperienced workers requires his company to make a large investment in training. The employer believed that IPCT would help to fill positions at the company. During the interview, the employer said that the company would be excited to hire someone who had been successful in the certificate or AAS degree programs because the programs teach students what they need to know to be successful in process control. He said that the coursework content related to electrical work was slightly more in-depth than was needed at his company, but that the content would likely be useful for other process control employers in the region.

Another employer partner indicated that the IPCT program was “headed in a good direction that would meet the majority of our needs.” This industry representative had visited the campus both before and after Southwest installed the hands-on process control equipment in the Solutions laboratory. During the second visit, he “saw much greater emphasis on the process industry” and “could tell that there had been significant efforts toward developing programs that are more focused on the process industry.” The respondent’s company manufactures different kinds of chemicals. He noted that the Southwest program placed more emphasis on steady-state processing, the type of process control necessary in a facility that processes one type of product, such as an oil refinery or a beverage company. He would like to see additional instruction in batch processing, but acknowledged that there is a greater regional need for steady-state process control technicians. He was pleased that Southwest offered to work with his company to develop courses or curriculum modules focusing on batch processing. Of the Solutions faculty and staff he said, “They have been inclusive and very responsive to my questions. I think they’ve got it [the IPCT program] going in the right direction.”

At the August 2016 meeting of the Process Technology Talent Sector Council, employers indicated that they would like technicians to have additional training in analyzing the root cause of problems within a process. In response, the grant coordinator from Southwest described how the Amatrol equipment in the Solutions laboratory has built-in fault codes to simulate the manufacturing environment. Employers at the council also said they would like workers to have stronger basic mechanical aptitude and reading comprehension skills. During an interview, another employer emphasized the importance of strong written communication skills for ensuring safety on the plant floor. These comments underscore the importance of a career pathway that includes a basic skills course, such as IRT.

Plans to Scale-up Internship Model

In 2015, the college partnered with KTG, a paper manufacturing company based in Memphis, to develop an electrical and instrumentation internship for students enrolled in AAS degrees in AIT and Engineering Technologies, two for-credit programs within the same department at Southwest as IPCT. Students can also enroll in IPCT courses while participating in the internship. Students work 20-25 hours per week at KTG for 18 months and receive a stipend. Thus far, four students, two

incumbent KTG employees and two other Southwest students, have participated in the internship. All four have either been hired permanently or advanced up the job ladder. Career services office staff at Southwest expressed a desire to learn from the program and incorporate additional employers, including those focused on the industrial process control technology sector.

Program Marketing and Participant Recruitment

Student recruitment could be the most significant challenge for the Solutions program. IPCT courses were not offered until the spring 2016 semester. As of July 2017, there have been only five enrollments in IPCT courses, and no students are enrolled in either the IPCT certificate or AAS degree. It was particularly challenging to recruit students prior to program approval. Although there was outreach to recruit students for IRT and AIIT courses that the college intended to count toward IPCT credentials, recruitment efforts accelerated in 2016, when IPCT courses were first offered (Table 4).

Table 4. Implementation Timeline for Recruitment Activities

Date	Solutions Project Milestone
Spring 2016	Website created for the IPCT program
Fall 2016	Meeting with marketing consultants to discuss marketing strategies to support the sustainability of the program
October 2016	National Manufacturing day event for high school students
November 2016	Process control career fair at Southwest

The Solutions proposal to the U.S. Department of Labor did not include an in-depth plan for marketing the program and student recruitment. Thus, it is difficult to determine the extent to which grant activities were consistent with the original program design. This section details recruitment-related challenges and recruitment efforts implemented in the last year of the grant.

Implementation Challenges for Recruitment

Delayed Implementation Timeline

During the three annual evaluation site visits, grant staff indicated that the slowed implementation timeline was the most significant obstacle to effective recruitment activities. Despite not yet being able to offer the IPCT program, grant staff employed several strategies to increase prospective students' interest during the first two years of the grant. The principal strategy was to visit IRT classes to introduce the process technology control field and encourage students to enroll in courses that would be cross-listed in the IPCT and AIIT programs. Despite these efforts, students were reluctant to enroll in a program that was not officially launched. During interviews early in the grant period, staff members said that it was difficult to generate interest in process control among students who were not currently working in the field. IRT graduates who sought further training at Southwest decided to enroll in other technical programs.

Lack of Understanding of the Process Control Field

At the beginning of the grant period, Southwest could have benefited from a strategic plan for marketing activities because of prospective students' lack of familiarity with the process control field or the job opportunities available within it. One staff member reflected on presenting the program to prospective students: "I have to specifically break down the Solutions program and what industrial process control is, what it does in a company...I haven't come across one person who knows what it is already. It's easier to grasp if they've been working in the industry."

To address potential participants' lack of knowledge, both Southwest staff members and employer partners suggested additional work-based learning opportunities or facility tours for high school students. According to one of the participants in the March 2017 TAACCCT 3 Advisory Board meeting, there is a "need to convey at a high level that manufacturing is not dirty, dangerous work."

From 2014 to 2016, there was some outreach to high schools focused on IPCT, described in earlier interim reports. The TAACCCT 3 Action plan, developed in the fall of 2016, included plans for increasing outreach to high schools. Proposed activities included tabling outside of area school cafeterias and athletic events, speaking at PTA meetings, and meeting with local guidance counselors. As of the spring of 2017, grant staff members had not attended events or held meetings at local high schools.

Marketing Activities in the Final Grant Year

During the 2016/17 academic year, the Solutions grant team conducted additional outreach and marketing activities. A website for the IPCT program launched in the

spring of 2016, when for-credit courses were first offered. Southwest plans to include graduate testimonials on the website once more students have completed coursework.

To supplement an IPCT brochure created in 2015, grant staff developed a series of talking points on process control, one of which describes the field and program:

Process control is an engineering discipline that deals with architecture, mechanisms, and algorithms for maintaining the output of a specific process within a desired range. For instance, the temperature of a chemical reactor may be controlled to maintain a consistent product output.

The talking points also include information about salary ranges for technicians in process control. They conclude with a detailed description of the IPCT technical certificate and AAS degree, including the format of the Amatrol coursework and how certificate coursework articulates to the AAS degree. In addition to the talking points, the coordinators of the TAACCCT grants at Southwest jointly created a slide show to promote the for-credit technical programs, including Solutions, entitled “Are You Southwest Skilled?”

In the fall of 2016, Southwest began working with the Redwing Group, a strategic marketing firm in Memphis, which has helped the workforce development department strengthen its print- and media-based marketing. The grant coordinator and the Associate Vice President of Workforce Development conducted radio and television interviews in the spring of 2017. Grant staff members are currently in the process of developing additional content for the website and content for Memphis Works, a website created by GMACW where local residents can learn about regional job opportunities and the training required for them.

Throughout the 2016/17 academic year, the workforce development and academic staff members at Southwest held outreach events on campus to promote the TAACCCT grants. In October 2016, Southwest hosted a National Manufacturing Day event, during which 50 high school students toured the campus’ advanced manufacturing facilities, including the Solutions laboratory. In November 2016, Southwest hosted a process control technology career fair in conjunction with the Process Technology Talent Sector Council meeting held at Southwest. During the fair, more than 100 high school and Southwest students had the opportunity to tour the laboratory facilities and speak with representatives of 12 process control employers. Examples of participating companies included: Coca-Cola, Hershey Foods, Lucite International, Memphis GP Cellulose, GlaxoSmithKline, Sonoco, Sparco.com, and Valero.

Prior Learning Assessments

The 2013 Solutions proposal outlined a plan for a grant to support the implementation of the Learning Counts, an online portfolio assessment system developed by CAEL. After an initial meeting with CAEL, grant staff determined that implementation of Learning Counts was not feasible. Instead, Solutions engaged to develop a PLA guide for staff designed to streamline the process for awarding credit for prior learning. The guide includes instructions for awarding prior learning credit. It also serves as a central location for the forms staff and faculty members need to submit to the college to award prior learning credit.

In addition to the guide, CAEL worked with Southwest to develop course challenge assessments for IPCT coursework. Course challenge assessments are local tests designed to verify learning achievement related to a particular course. The full implementation of the course challenge exams is ongoing.

Data and Tracking Participants

The designers of the Solutions program originally intended to create a comprehensive data tracking system to track participants as they moved through the process control career pathway. The online dashboard would have allowed students to track their progress through the Learning Counts system. Faculty and staff were to track students through Amatrol, KeyTrain, and Salesforce. Although the Amatrol and KeyTrain systems are available to IPCT and IRT students and faculty respectively, the Salesforce system was not purchased because it did not meet the TBR's security requirement. Thus, the timeline for full adoption of a data tracking system was delayed (Table 5). In addition, the definition of a grant participant was broad, creating confusion about which students intended to enroll in the IPCT program.

Despite data challenges, grant staff took steps to ensure the sustainability of future collection of student data by transitioning the management of student files and services to the student and career services offices at the college.

Table 5. Implementation Timeline for Activities Related to Data and Tracking Students

Date	Solutions Project Milestone
Spring 2014	Initiation of procurement process for Salesforce
Fall 2014	TBR indicated that it must approve the data tracking tools purchased

Date	Solutions Project Milestone
Spring 2015	TBR determined that Salesforce cannot be purchased. Grant staff considered other options.
Summer 2015	Selection of the G*Stars system for tracking grant participants
Fall 2015	Implementation of G*Stars
November 2016	Workforce development staff transitioned participant case-management responsibilities to the student services and career services offices.

Prior to the submission of the proposal to the Department of Labor, the Solutions grant team would have benefited from an initial planning period to assess the feasibility of purchasing the Salesforce system and using it for data tracking. Had appropriate background research been conducted, the design team might have anticipated that the college would need to seek approval from the TBR to purchase Salesforce and that it might not meet the organization's security requirements. Because the college was not aware of these requirements, the implementation of a TAACCCT-specific data system was delayed by more than a year.

Definition of a Participant

The U.S. Department of Labor's definition of a participant in a TAACCCT-funded program is broad. Participants can include students who enroll in a course supported with grant funds. The college intended for some of the courses in the IPCT technical certificate and AAS degree to overlap with requirements for AIIT, another program within the technologies department. Prior to the official launch of the IPCT program, Southwest counted students who enrolled in these overlapping courses as participants, asking them to complete a grant intake form. However, the intake form did not include questions about whether the student intended to pursue a credential or employment in the process control field. Thus, it was impossible to determine the level of treatment for each participant. It is possible that all students counted as participants were pursuing an established certificate or AAS degree in AIIT rather than the IPCT program, which was the focus of the grant.

Transition of Data Responsibilities to Other Offices

In November 2016, the workforce development staff transitioned tracking of student data and case management to the student services and career services offices. The purpose of the transition was to support the long-term sustainability of the grant's

data system and to ensure students' continued access to services. The student services office is responsible for advising and academic support, while career services follows up with students to track their employment and offers career planning support such as assistance with mock interviews and resume development.

Solutions grant staff identified the for-credit students who were still enrolled and forwarded their files to student services. The student services office is working to expand intrusive advising to all students. Intrusive advising is a process of ongoing, proactive contact intended to make sure students are on track academically and motivated to persist in college. The student services office reaches out to students via e-mail, phone, and text to ensure that they are academically on track. As of March 2017, the office had conducted two rounds of outreach to Solutions students.

Similarly, career services staff have conducted multiple rounds of outreach to students who have completed the IRT program or are no longer active in for-credit coursework. A major goal of this outreach is to track employment outcomes for the TAACCCT grants. Staff members have reached out to all TAACCCT participants to see where they are employed and whether they secured new employment or received a pay increase after completing a program or leaving Southwest. A second purpose of the outreach is to invite Solutions participants to take advantage of the college's career services, such as interview preparation, resume assistance, and ongoing career fairs. Several students expressed interest in returning to the college to continue their educations. The career services office refers these students back to student services.

The career services office sends information on employment outcomes back to the workforce development staff for grant reporting purposes. The grant has documented employment outcomes for 23 current and former participants, including 19 IRT completers and four AIIT students. Of those, 13 (54 percent) reported being employed at Smith & Nephew. Several students shared stories of how they gained employment or received a wage increase after completing IRT. For example, one student wrote after a job interview, "[The company] said I did excellent and that they wanted to offer me a position as a line technician with a starting pay rate of \$16.19 an hour with shift differential."

Outcomes Study: Descriptive Results

Due to the delayed implementation of Southwest's Solutions program, we are unable to run the initially planned analyses. As there have been only five IPCT course enrollments, some of which may be the same students taking different courses, there is no reliable way to estimate the Solution program's impact. Systematic data on these students have not yet been collected or made available to CNA, making even a description, let alone any attempt at a causal impact of the impact of IPCT enrollment, impossible.

Even with the available data, we cannot perform a rigorous impact analysis. Part of this is for methodological reasons. Without valid treatment and comparison groups for the for-credit IPCT students, we cannot run regression-based analyses that will lead to causal conclusions. Available data also limit the questions that we can answer: too few students report data on employment or wages to reliably estimate the impact of AIIT or IRT courses on these outcomes (especially since whether a student reports his or her wage or employment status may depend on the wage or employment status themselves).

As a result, we instead provide a high-level descriptive overview of participant characteristics and of some medium-term outcomes for IRT enrollees and AIIT enrollees. The results are drawn from program enrollment and participation data provided by Southwest.

Demographic and Enrollment Statistics

In total, there were 407 Solutions grant participants. Of these, 176 participated in the non-credit IRT program designed to prepare students for entry-level manufacturing jobs, while 107 were enrolled in the for-credit Advanced Integrated Industrial Technology (AIIT) program.³ An additional 93 students were enrolled in ISO or Lean Six Sigma certification courses, and 31 students took other courses or programs at

³ Our data came from multiple data sets, and several students were listed as AIIT participants in one data set but as participants in other courses in another data set. We have counted these students as AIIT participants for the purposes of this report.

the college. We present separate summary statistics for all students who completed intake forms, IRT students, AIIT students, ISO and Lean Six Sigma students, and other students (Table 6). The first set of columns includes all students across all listed programs. The second set of columns contains only IRT students, and the third contains only AIIT students. The fourth contains both ISO and Lean Six Sigma students, and the fifth contains all students not captured in any of the categories above.

The average student completing an intake form was approximately 37 years old. Nearly two-thirds of these students are male, and nearly three-quarters of respondents (those students providing information for a particular survey item) are African American. Eight percent of respondents are veterans, while less than one percent are spouses of veterans. Approximately two percent of respondents indicated some form of disability, though disability type is not observed in the data. Nearly half of respondents were employed; however, it is likely that this overestimates the employment rate among all students who filled out intake forms because data on employment were missing for 56 respondents. No students in our sample were eligible for TAA benefits.

Table 6. Demographic and Enrollment Characteristics of Solutions Participants

	All Students		IRT		AIIT		ISO/Lean Six Sigma		Other	
Characteristic		N		N		N		N		N
Mean Age at Entry	37.4	406	34.9	176	35.7	107	43.2	93	40.6	30
Percent Male	65.8%	406	60.8%	176	95.3%	107	31.5%	92	93.5%	31
Percent African American	74.7%	376	91.9%	173	49.4%	83	79.8%	89	32.3%	31
Percent Veteran	8.0%	339	6.6%	167	10.5%	57	7.9%	89	11.5%	26
Percent Veteran Spouse	0.3%	310	0.0%	143	1.9%	53	0.0%	88	0.0%	26
Percent Disabled	1.8%	339	1.2%	171	1.8%	57	3.4%	89	0.0%	22
Percent Employed	49.6	351	35.3%	173	32.8%	58	71.9%	89	96.8%	31
Percent Enrolled Full-Time	4.1%	386	N/A	N/A	15.0%	107	N/A	N/A	0.0%	31

Students enrolled in IRT courses are two-and-a-half years younger than students overall. They are approximately 5 percentage points less likely to be male and 17 percentage points more likely to be African American than all Solutions participants. They are approximately 14 percentage points less likely than the overall sample to be employed.

AIIT enrollees are about a year older on average than IRT enrollees. They are overwhelmingly male—fewer than five percent are female. Approximately half are

African American. AIIT enrollees are only two-thirds as likely as students overall to be employed.

ISO and Lean Six Sigma enrollees are over eight years older than IRT students on average. Under a third are male, while nearly 80 percent are African American. Over 70 percent of short-term certification seekers are employed.

A small group of students were listed as Solutions participants despite not taking the IRT, AIIT, ISO, or Lean Six Sigma programs. Of these students, 23 took courses in Industrial Electrical Training, while 7 took courses for Welding Certification. These students were over 5 years older than IRT students on average. Over 90 percent were male, and less than a third were African American. Nearly all of these students are employed.

IRT WorkKeys Results and Program Completion Rates

Although we cannot analyze the impact of the IRT program on employment or wages, we were able to combine program data for IRT students with data on pre- and post-course WorkKeys assessments. IRT students took three WorkKeys assessments at both the beginning and the end of their program: Applied Mathematics, Locating Information, and Reading for Information. Their post-scores determined whether and what level of National Career Readiness Certificate (NCRC) they earned. The Applied Mathematics assessment focused on the problem solving and mathematical reasoning skills necessary for math-related situations that occur in the workplace. The Locating Information assessment measures participants' ability to locate, synthesize, and use information in graphic documents found in the workplace. Finally, the Reading for Information assessment focuses on participants' ability to identify and use information in written documents, such as memos, directions, and workplace policies.

On each of the three assessments, the largest group of students experienced no change in their score levels. However, a sizeable group of students increased their scores on each assessment—33.6 percent in Applied Mathematics, 16.8 percent in Locating Information, and 28.4 percent in Reading for Information. As Locating Information was the subject with the fewest score increases and the most score decreases, IRT instructors might consider investing additional time on skills related to Locating Information or reassessing the effectiveness of their instructional approach.

Detailed results are provided in tables 7 through 12. Separate sets of tables present results for scores on the Applied Math (tables 7 and 8), Locating Information (tables 9 and 10), and Reading for Information (tables 11 and 12) assessments.

In Table 7, students are sorted on a grid of pre- and post-test score level in Applied Mathematics. Each row represents a different pre-test score level, while each column represents a different post-test score level. Cells in the table are shaded based on the degree of improvement or decline participants experienced. Greater degrees of improvement are shaded in brighter green, while greater degrees of decline are shaded in darker red. Cells showing no change between pre- and post-scores are white, while cells corresponding to missing pre- or post-test values (which cannot be compared) are shaded in gray.

In Table 8, this information is condensed into a two-row table showing the percent of students whose score levels decreased by a particular number of levels, shaded to correspond to Table 7. The report presents both tables because Table 8 is more compact and easier to interpret, while Table 7 shows where particular gains and losses occur, which may be of value when prioritizing student supports. Values in Table 8 will not add up to 100 percent, since approximately 12.3 percent of students had missing values on either the pre-test or the post-test.

Table 8 shows that approximately 43 percent of students had the same score level on both the pre- and post-Applied Mathematics assessments. Just under 30 percent increased by one level, while 9 percent decreased by one level. Approximately 4 percent increased by two levels, and 2.6 percent decreased by two levels. No students improved or declined by more than two levels.

Table 7. Level Changes in WorkKeys Applied Math Pre-Test/Post-Test Scores

		Post-Test Score							
		< 3	3	4	5	6	7	Missing	Total
Pre-Test Score	< 3	0	3	0	0	0	0	1	4
	3	3	10	9	2	0	0	3	27
	4	3	7	24	27	4	0	6	71
	5	0	0	4	28	5	0	4	41
	6	0	0	0	0	4	2	1	7
	7	0	0	0	1	0	0	0	1
	Missing	1	1	1	1	0	0	0	4
	Total	7	21	38	59	13	2	15	155

Table 8. Summary of Level Changes in WorkKeys Applied Math Pre-Test/Post-Test Scores

Difference	Decrease	Increase
0 Levels	42.6%	
1 Level	9.0%	29.7%
2 Levels	2.6%	3.9%
3+ Levels	0.0%	0.0%

Table 9 and Table 10 show corresponding score level patterns on the Locating Information assessment. On this assessment, approximately 57 percent of students kept the same score level, with nearly half of all students scoring at level 4 on both exams. No IRT students scored at levels 6 or 7 on this section. Approximately 14 percent fell by one level, while 16 percent rose by one level.

Table 9. Level Changes in WorkKeys Locating Information Pre-Test/Post-Test Scores

		Post-Test Score					
		< 3	3	4	5	Missing	Total
Pre-Test Score	<3	0	5	2	0	0	7
	3	1	10	12	0	1	24
	4	0	14	74	7	12	107
	5	0	1	6	4	2	13
	Missing	1	0	3	0	0	4
	Total	2	30	97	11	15	155

Table 10. Summary of Level Changes in WorkKeys Locating Information Pre-Test/Post-Test Scores

Difference	Decrease	Increase
0 Levels	56.8%	
1 Level	13.5%	15.5%
2 Levels	0.6%	1.3%
3+ Levels	0.0%	0.0%

Table 11 and Table 12 show how IRT students performed on the Reading for Information section of WorkKeys. Approximately 45 percent of all students kept the same score level, just over a quarter increased by one level, and approximately 13 percent decreased by one level. Among students who improved or declined, the most common movement was from level 4 to level 5, followed by from level 5 to level 6. As before, no students' scores rose or fell by more than two levels.

Table 11. Level Changes in WorkKeys Reading for Information Pre-Test/Post-Test Scores

		Post-Test Score						
		3	4	5	6	7	Missing	Total
Pre-Test Score	3	0	3	0	0	0	0	3
	4	3	26	21	3	0	5	58
	5	0	10	35	14	1	9	69
	6	0	2	8	7	2	1	20
	7	0	0	0	0	1	0	1
	Missing	0	2	1	1	0	0	4
	Total	3	43	65	25	4	15	155

Table 12. Summary of Level Changes in WorkKeys Reading for Information Pre-Test/Post-Test Scores

Difference	Decrease	Increase
0 Levels	44.5%	
1 Level	13.4%	25.8%
2 Levels	1.3%	2.6%
3+ Levels	0.0%	0.0%

Table 13 and Table 14 show which levels of the National Career Readiness Certificate (NCRC) students earned, based on overall WorkKeys scores. Students whose scores were listed as “missing” or as “NC” are shaded in gray on these tables, as these scores cannot be compared; nearly a quarter of students had a missing score on both the pre- and post-assessments. Over 50 percent of students earned the same certificate level, with nearly 40 students achieving a silver NCRC based on both pre- and post-assessments. Approximately 13 percent of students increased their performance by one level, while 3 percent fell by one level.

Table 13. Level Changes in National Career Readiness Pre-Test/Post-Test Scores

		Post CRC					Total
		NC	Bronze	Silver	Gold	(missing)	
Pre CRC	NC	1	8	0	0	0	9
	Bronze	0	14	15	0	0	29
	Silver	1	3	61	5	2	72
	Gold	0	0	1	6	0	7
	(missing)	1	1	0	0	36	38
	Total	3	26	77	11	38	155

Table 14. Summary of Level Changes in National Career Readiness Pre-Test/Post-Test Scores

Difference	Decrease	Increase
0 Levels	52.3%	
1 Level	2.6%	12.9%
2+ Levels	0.0%	0.0%

IRT Certificate and Program Completion Rates

Of the 155 students with WorkKeys scores, 114 earned a NCRC. In total, 7 percent (N=11) earned a Gold NCRC, fifty percent (N=77) earned a Silver NCRC, and 17 percent (N=26) earned a Bronze NCRC.

Of the 155 students with WorkKeys scores, 120 (77.4%) also had IRT completion certificate or OSHA certification completion data. In total, 114 (73.5%) received both an IRT and ten-hour OSHA certification, two (1.3%) received just an IRT certificate, two received just ten-hour OSHA certification, and two received neither. Thirteen students had IRT certificate data but no WorkKeys data.⁴

Of 176 students with IRT intake data, 123 (69.9%) were listed in the data as completing an IRT certificate, an OSHA certificate, or both. Of those that were not listed as such, seven (4.0%) appeared in the completion data but had no date of completion or certification type listed, while 46 (26.1%) did not appear in the completion data at all. Of the 123 students that received some form of certification, 117 (66.4%) received an IRT certificate, 119 (68.8%) received a ten-hour OSHA certificate, and 115 (65.3%) received both certificates.

AIIT Credits and Persistence

Although we do not have assessment scores for AIIT students, we are able to examine credit patterns over the two school years for which we have data. These data cover parts of the 2014 and 2015 school years; we do not have any data on credits earned from fall 2015 onwards. These patterns also let us make some inferences as to whether students are persisting from one year to the next.

⁴ Of these students, two had both IRT and ten-hour OSHA certification, four had just ten-hour OSHA certification, and seven had neither.

Of the 58 students for whose intake data we were able to merge with credit data, 48 (82.8%) earned credits in either year. Separating enrollment by year, 24 (41.4%) earned any credits in year one (covering the spring and summer terms of 2014), while 41 (70.7%) earned any credits in year two (covering fall 2014, spring 2015, and summer 2015). Five students attempted a positive number of credit hours in year one but did not earn any credits, while seven students attempted but did not earn credits in year two. There were 17 students (29.3%) who earned credits in both years, leading to a for-credit persistence rate of 17/24, or 70.8 percent. Although the number of AIIT students included in this study is small, the retention rate is more than 18 percentage points higher than Southwest's overall freshman to sophomore retention rate of 52.5 percent in 2015/16 (Tennessee Higher Education Commission, 2016).

Readers should be careful to avoid conflating the for-credit persistence rate with the overall persistence rate, as our data do not allow us to observe why students do not earn any credits in a given year. For example, if we assume that students with zero credits in a given year were not enrolled, this would mean that the for-credit and overall persistence rates are equal; however, if we assume that students with zero credits were all enrolled in non-credit courses, we would have an overall persistence rate of 100 percent. Thus, although we cannot presently form any conclusions about overall persistence, we can at least determine whether students who earned credits in year one went on to earn credits in year two.⁵

The average number of credits earned (among the 48 students who took any credits) is 10.3. We restrict our analysis to students who earned credits in a given time period, as the decision of some students to enroll in a non-credit program should not factor into any analysis of how intensely for-credit students pursue their studies. The 24 students who enrolled in year one earned an average of 13.5 credits, while the 41 students who enrolled in year two earned an average of 11.6 credits. However, students who enrolled in both years earned 17.8 credits, 7.7 more than the combined number earned by students who took classes in year one only and year two only. This implies that students who earned credits in both years earned more credits in each year than students who took credits in that year alone.

⁵ Complications may arise if some students do not persist because they complete the AIIT program.

Conclusion: Lessons Learned from the Implementation of Solutions

The core component of the Solutions grant, the stacked and latticed credential program leading to a technical certificate and AAS degree in industrial process control, was developed and offered to Southwest students as a result of the Solutions grant, yet Southwest experienced challenges throughout the grant period that impeded the full implementation of proposed grant activities.

The grant proposal could have benefited from additional preparatory work prior to its submission to the U.S. Department of Labor. According to current grant staff members, additional consideration should have been given to whether the program was designed in a way that aligned with the needs of prospective students and employers. In addition, the grant would have benefited from a program implementation planning period prior to the start of the grant period. Such a planning period would have allowed for the development of an in-depth implementation timeline and contingency plans for possible implementation challenges. Other activities that would have benefited the grant include earlier engagement with employer partners and the development of clear lines of authority related to project administration and succession plans. This section briefly discusses each of these lessons and how additional activities might have supported implementation. It concludes with a discussion of ongoing sustainability planning efforts and an overall summary of grant implementation.

Considerations for Program Design

Southwest experienced a challenge with recruiting students to participate in the for-credit process control technology programs. Although the delayed implementation timeline made recruitment especially difficult, Southwest did not consider whether the program was aligned with the level of commitment that students were likely to make to for-credit certificate and degree programs. According to grant staff members interviewed during the 2017 site visits, the design of the Solutions program did not take into account the barriers that students face. In addition to being unfamiliar with the process control technology field, prospective students may be

transient. Many older students must prioritize work and family obligations and may not have one, two, or more years to commit to earning a credential.

Current grant staff suggested that the Solutions program should have included a non-credit process control program, similar to the short-term training programs that Southwest developed for employers. The non-credit program could articulate into a for-credit certificate program. According to one of the respondents, “we need to let students exit with something, then be able to come back for a credential.” Respondents believe that such an approach would have been beneficial for both students and employers. Short-term, non-credit programs can help employers fill short-term vacancies. Similarly, such programs help students secure employment quickly while still providing them with the opportunity to pursue a for-credit certificate or AAS degree.

Pre-Implementation Program Planning

The Solutions grant would have benefited from an in-depth program planning period prior to the submission of the grant proposal to the U.S. Department of Labor. A planning process would have allowed program designers to develop a realistic program timeline, assess whether the college had the resources to implement all aspects of the program effectively, and plan for the possible simultaneous implementation of three Round 3 TAACCCT grants.

Through the planning process, staff members could have anticipated challenges and developed contingency plans. Areas of focus could have included programmatic decisions related to data systems and curricula as well as development of a strategy for recruitment and marketing. In-depth pre-planning may have mitigated some of the implementation challenges that the grant ultimately faced.

During the pre-program planning period, program designers could have made concrete decisions regarding the development of a curriculum for the for-credit programs. In reality, the draft curriculum was not submitted to the TBR until the spring of 2015, a year and a half into the grant period. It took nearly an additional year for the program to be approved. If the draft curriculum had been completed and submitted to the TBR at the award of the grant, classes likely would have been offered earlier.

During the pre-program planning period, Southwest could have developed a plan to recruit students into the for-credit IPCT programs as soon as they were offered. The Solutions proposal did not include a recruitment plan and relied heavily on the assumption that IRT completers would transition into the for-credit programs, which they did not. In general, grant staff found that students who did not already work in

process control were unfamiliar with the field or career opportunities within it. This challenge highlights the need for a detailed marketing and recruitment plan.

Finally, pre-planning could have allowed program designers to anticipate roadblocks and develop contingencies. For example, planners could have consulted representatives from the TBR to learn about the board's security requirements for data systems and planned to purchase one that met those requirements. Such planning would have allowed Solutions to have a consistent data tracking system in place several months prior to when G*Stars was ultimately purchased. The pre-program planning period would have also allowed for the development of a contingency plan for a protracted TBR approval process.

Earlier Engagement with Employers

The Solutions proposal called for the development of an employer workgroup, yet an employer advisory board for the TAACCCT grants at Southwest was not established until 2016. Although Southwest did engage employers to review the Solutions curriculum and employers were generally satisfied with it, sustained employer engagement could have been a focus much earlier in the grant. This would have allowed Southwest to adjust courses based on employer needs.

The establishment of an employer advisory council and an initial meeting could have been part of the pre-program planning process, detailed above. At that time, Southwest and participating employers could have discussed the level of commitment required of the advisory council and the best approach for gathering input from members.

Establishing an advisory council earlier would have allowed for ongoing, in-depth collection of employer feedback on the extent to which the IPCT program aligned with labor market needs. Process control employers could have provided regular updates on their labor market forecast, including the number of current openings and the number of vacancies that they anticipated in the coming months and years. A well-established advisory council could have also regularly shared information with Solutions staff about the skills they expect from prospective employees. For example, at the TAACCCT 3 Advisory Board meeting in March 2017, employers shared information about the Ramsay assessment they require applicants to take. The TAACCCT programs at Southwest could have benefited from such information earlier, perhaps integrating preparation for the assessment into coursework.

A longstanding employer advisory council may have also supported recruitment efforts. Employers might have been able to recommend the program to incumbent workers who were interested in building their skills. They also potentially could have shared information about the program with their professional networks.

Establishment of Lines of Grant Administrative Authority and Succession Plans

During site visits in all three years, confusion about who was in charge of decision-making emerged as an implementation theme. The grant was administered by the non-credit workforce development department but housed in the for-credit technologies department. The grant coordinator with the longest tenure did not feel empowered to make decisions without consulting others. Grant staff should have developed an organizational chart with clear lines of authority and communication across departments.

Given that slow responses from departments that did directly administer the grant were sometimes an issue, the organizational chart could have also specified whom to reach out to if a response was not received promptly. The organizational chart would benefit both people listed on the chart, by helping them understand their responsibilities, and people trying to engage with grant decision-makers at Southwest.

Perhaps most importantly, the grant coordinator and the director of workforce development should have been established as grant leaders and been given the ultimate responsibility for all grant-related decisions. It would have been beneficial for the grant coordinator to have direct contact with the project officer at the U.S. Department of Labor rather than establishing the procurement specialist at the sole point of contact. Then the grant coordinator could have followed up more frequently with the project officer on the status of equipment purchase requests and other grant administration matters. If the grant coordinator role had been clearly established as a leadership role, perhaps the person fulfilling the position would have felt more empowered.

Given the large amount of staff and leadership turnover that Solutions experienced, the grant would have benefited from the development of succession and continuity plans. The plans could have detailed how to onboard the next person and ensure that ongoing conversations, such as those with employers, continued. Each plan could have outlined the staff member's roles and responsibilities.

Sustainability Plan Development

Throughout the March 2017 site visit, respondents emphasized the need to develop a strong sustainability plan. Although the grant increased the capacity of Southwest through new curricular resources and equipment, staff sought to ensure that the for-credit programs thrived after the conclusion of the grant. One respondent said, "How

do we ensure that we have a workforce that is trained as the result of the investment? How do we create an employer pipeline for process control?”

As of June 2017, Solutions grant staff members were in the process of developing a sustainability plan using the [TAACCCT Sustainability Toolkit](#) from the TAACCCT Learning Network website. The goal of the sustainability plan is to ensure the ongoing implementation of the process control stacked and latticed credentials.

There have been initial challenges with sustainability. For example, there have been no new Solutions IRT sections since the end of grant programming in the spring of 2017. Grant staff members emphasized the importance of sustained efforts to market the non-credit and credit programs to employers and students.

Implementation Summary

Overall, the Solutions TAACCCT grant increased the capacity of Southwest Tennessee Community College to offer sub-baccalaureate credentials in the in-demand field of industrial process control technology. The stacked and latticed credential program proposed in the original grant proposal was developed and offered to students as a result of TAACCCT funding. The grant funded the scale-up of the IRT program, which provides students with the academic, technical, and workforce readiness skills necessary to succeed in entry-level employment or transition to a for-credit technologies program at Southwest. As a result of grant funding, Southwest invested in the equipment and instructional resources necessary to offer a for-credit certificate and AAS degree in IPCT. In the fall of 2017, the college will offer several IPCT courses, including Introduction to Process Control Technology, Millwright I, Quality, and Process Control Technology I. Employer partners have offered positive feedback on the program, indicating that content was well-aligned with the skills they were seeking in new hires.

Several challenges precluded the full implementation of the grant activities and program components that Southwest outlined in the original Solutions proposal. The most significant challenge was the delayed implementation timeline. The college intended to implement the AAS degree in the fall of 2014, but TBR did not approve the program until late 2015, and IPCT courses were not officially offered until the spring of 2016. The delayed approval presented challenges for the recruitment of students and employer partners. In addition, the college did not incorporate ISA and Kauffman Foundation certificates into the credentials because attention was focused on launching the for-credit programs.

Administrative regulations prevented the implementation of other program components. For example, the data tracking system that Southwest proposed did not meet TBR's security requirements. Thus, implementation of a data system for the

grant was delayed. A final challenge to implementation was how the grant was administered. For much of the implementation period, the grant coordinator had no direct contact with the project officer at the U.S. Department of Labor. There was also confusion about whether the workforce development department or the technologies department was ultimately responsible for grant-related decisions. These administrative challenges likely slowed the progress of implementation.

In the final year of the grant, staff members made a concerted effort to strengthen implementation. Southwest engaged an external strategic planning consultant with expertise in the manufacturing field. He worked with all three TAACCCT grant coordinators to develop a plan for strengthening recruitment and employer engagement efforts. Staff members partnered with the Redwing Group to develop new marketing materials and increased outreach to prospective students through a series of in-person career fairs and information sessions. Southwest also significantly increased employer engagement through the establishment and regular meetings of the TAACCCT 3 Advisory Board. The transition of data collection and case management to the student services and career services office helped ensure the sustainability of grant activities.

Appendix: Example of the Interview Protocol

Interview Protocol for Southwest Solutions Counselor

Start with introductions and a brief description of the study.

Thank you for agreeing to discuss your experience as the Solutions counselor. CNA is the third-party evaluator for Southwest Solutions.

Before we begin the interview, I want go over consent procedures and have you sign this consent form if you agree to participate. The information you provide will be used to draft the final report on the Solutions program that will describe the views of Southwest Solutions staff, faculty, and students. It will suggest ways to make Southwest Solutions more effective and highlight strong practices.

Your comments will be kept strictly confidential; your name or any other identifying characteristics will not be associated with specific comments. The interview will take about 20 minutes. You can stop the interview at any time or choose not to answer specific questions.

Do you have any questions about the study, interview, or consent form?

Is it OK if I record our conversation? I'll only use the recording to ensure CNA captures what you said accurately.

Role

1. Describe your current role within Southwest Solutions?

Probes:

- What's a typical day like for you?

2. Have your professional responsibilities changed over the course of the grant?

Probe: If so, tell me more about that. What were the biggest challenges to taking on new roles?

Recruitment

3. Tell me about how students are currently recruited.

Probe:

- How does Southwest partner with other organizations (e.g., WIN) during the recruitment process?
 - How does Southwest partner with employers?
4. What have been the most significant changes to the recruitment strategies during the grant period?
 5. What have been the most successful recruitment strategies?

Students Served

6. How do you help a student determine which program or credential he or she should pursue?

Probes:

- Do students take a skill assessment prior to enrolling in the Solutions program?
- **If so**, how are the results used?

Support and Counseling Services

7. How do you work with students once they have enrolled in the program?

Probes:

- What guidance or information do you share with students?
- Which counseling strategies do you use?

8. What challenges or barriers to success do students face when they enter the program? During the program?

9. How do you work with students to address the challenges they face?

10. Tell me about the career guidance and placement services students receive from Southwest.

Probes:

- What kind of career guidance do current students receive? How is it tailored to their needs?
- Are there changes you would suggest for the program's approach to career services/guidance?

11. What academic and social support services are available to students (e.g., tutors, supportive clubs, etc.)?

Probes:

- To what extent do students use these resources?
- How helpful do students perceive these services to be?

12. What reasons do students who have dropped out of or stopped the program cite for leaving?

Relationship with program faculty and staff

13. How do you collaborate with grant staff?

14. How do you collaborate with faculty?

Probes for both questions:

- What information do you share?
- How do you support each other's work?
- How do you work together to address students' needs?
- Have there been any issues or challenges with collaboration?

Program Implementation

15. Do students have a clear understanding of what they are expected to be able to do once they complete their program?

16. How do employers contribute to program development and implementation?

17. How do other partner organizations contribute to program development and implementation?

Outcomes

18. Which aspects of the Solutions program have been most beneficial to students, and why?

19. Which aspects of the Solutions program have been *least beneficial* to students, and why?

20. Of those students you worked with who completed the IRT, what factors contributed to their success?

Probes:

- What, if any, barriers to program completion did these students face?
- How did they overcome them?

21. What information do you have about the job performance of Solutions graduates, and how Solutions might have contributed to that performance/success?

Probe: Have there been any changes to the grant program as a result of this feedback?

22. Are there IRT completers now enrolled or planning to enroll in the IPCT?

Probe:

- What else could Solutions do to encourage students to continue their education?

Overall Impressions

- 23. What additional resources or information, if any, would help you do your job?
- 24. What changes, if any, would you make to the Solutions program?
- 25. **(If this has not already been captured):** How has the Solutions program increased the community college's capacity to serve students?

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